

IX. "On the Solubility of Salts in Water at High Temperatures."

By WILLIAM A. TILDEN, D.Sc. Lond., F.R.S., Professor of Chemistry in the Mason Science College, Birmingham, and W. A. SHENSTONE, F.I.C., F.C.S., Lecturer on Chemistry in Clifton College, Bristol. Received June 19, 1883.

(Abstract.)

This paper contains an account of experiments made with the view of determining the solubility of salts in water at temperatures above the boiling point of water. They were originally undertaken with the object of further investigating the anomalies presented by sulphate of soda, but the method adopted was afterwards applied to many other metallic salts, and the paper presents an account of determinations so made, together with a discussion of the theoretical bearing of the results.

The main conclusion arrived at is that solubility is directly related to fusibility. Of the salts operated upon some habitually crystallise with water of crystallisation, others habitually in the anhydrous state. When the latter are written down in the order of their melting points, beginning with the most fusible, it is observed that increase of solubility consequent upon a given rise of temperature above 100°C. , is greatest in the most fusible, least in the least fusible, and all the cases observed follow this rule in regular order. If the results are represented graphically, taking for abscissæ the degrees of temperature and for ordinates the quantity of salt dissolved in 100 parts of water, it is at once seen that the higher the melting point the more nearly do the curves so constructed approach a straight line. The relation is illustrated by the case of the chloride, bromide, and iodide of potassium, the solubilities of which at all observed temperatures follow the order of the melting points. Also in comparing together two such salts as chlorate and chloride of potassium, the solubilities and melting points of which are as follows, the curves cutting each other at 100° :—

	Melting point.	Solubility at			
		0° .	100° .	130° .	180° .
Potassium chlorate	359°	3·3	56·5	88·5	190
„ chloride	734°	29·2	56·5	66	78

As to sulphate of sodium the solubility increases as the temperature

risks from 0° to 34° , the melting point of the decahydrated salt $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$. Thereafter the solubility diminishes till the temperature of 120° is reached. From 120° to 140° we find the change if any is inappreciable, but at 160° a notable increase of solubility is observed, which is still further increased at 180° and at 230° , the highest temperature reached.

Parts by weight of anhydrous sulphate of sodium dissolved by 100 parts of water at							
0° .	34° .	100° .	120° .	140° .	160° .	180° .	230° .
5	78.8	42.7	41.95	42.00	42.9	44.25	46.4

In view of these and other facts, theories of hydration can no longer be admitted as competent to explain the act of solution in all or even more than a few cases.

- X. "On the Determination of the Number of Electrostatic Units in the Electromagnetic Unit of Electricity." By J. J. THOMSON, M.A., Fellow and Assistant Lecturer of Trinity College, Cambridge. Communicated by Lord RAYLEIGH, F.R.S. Received June 19, 1883.

(Abstract.)

This paper contains an account of some experiments which have been made during the last two years in the Cavendish Laboratory, Cambridge. These experiments were made to determine " v " by comparing the electrostatic and electromagnetic measures of the capacity of a condenser. The condenser consisted of two cylinders fitted with guard-ring pieces. The electrostatic measure of the capacity was calculated from the dimensions of this condenser. The electromagnetic measure of the capacity was determined by a very slight modification of the method given in § 775 of Maxwell's "Electricity and Magnetism." In this method the condenser has to be repeatedly charged and discharged by a commutator, and a very elaborate commutator would be required to work the guard-ring part of the condenser; for this reason the capacity of the guard-ring condenser was experimentally compared with the capacity of another condenser without a guard-ring, the capacity of the latter being altered until the capacities of the two condensers were equal. The electromagnetic measure of the capacity of the condenser without a guard-ring was then determined by Maxwell's method. The ratio of the